



IST Co., Ltd.  
TEST REPORT NO. : 12-IST-0161

# Certification of Compliance

## CFR 47 Part 15 Subpart B

Test Report File No. 12-IST-0161 ☒ Basic ☐ Alternate  
Date of Receipt March 23, 2012 Begin of test date April 05, 2012  
Date of Issue April 12, 2012 End of test date April 06, 2012  
FCC ID ZGB-WB-859-01  
Kind of Product U-Board wired  
Basic Model(s) WB-859-01  
Applicant PENANDFREE CO., LTD  
Address #801, Kenmkang Hitech Valley 2<sup>nd</sup>, 138-1, Sangdaewon-dong,  
Jungwon-gu, Seongnam-si, Gyeonggi-do, South Korea  
Manufacturer PENANDFREE CO., LTD  
Address #801, Kenmkang Hitech Valley 2<sup>nd</sup>, 138-1, Sangdaewon-dong,  
Jungwon-gu, Seongnam-si, Gyeonggi-do, South Korea  
Standard Section 15.107, Section 15.109 [Class B]

### Test Result

☒ Positive

☐ Negative

Tested By

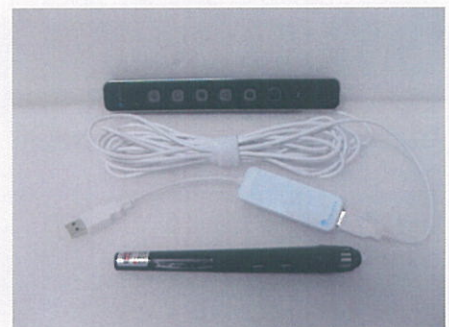
Approved By

H.J.KIM

S.J.CHO

### Comment(s)

- Investigations requested : Measurement to the relevant clauses of FCC rules and regulations Part 15 Subpart B - Unintentional Radiators, Class B.
- The test report with appendix consists of 19 pages.
- The test result only responds to the tested sample.
- It is not allowed to copy this report even partly without the allowance of IST EMC Laboratory.
- This equipment as for has been shown to be capable of continued compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in ANSI C63.4 2003.





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*Note:*



## INFORMATIONS OF TEST LABORATORY

IST EMC LABORATORY (*FCC Filing Lab.*)

400-19, Singal-dong, Giheung-gu, Yongin-si,

Kyonggi-Do, 446-599, Korea

TEL : +82 31 326 6700

FAX : +82 31 326 6797

KOLAS Testing No. : 118

RRA Designation No. : KR0018

FCC Registration No. : 400603

FCC(DoC) Registration No. : 801060

VCCI Member No. : 1739



## POWER SUPPLY SYSTEM USED

Power supply system 120 V, 60 Hz

(Refer to the product information)

## Measurement Uncertainty

The measurement uncertainty was evaluated for all test items listed in this report. Also it, " The evaluation and treatment of uncertainty ", is described in IST Quality Manual according to ISO17025 Guide. The data and results described in this report are true and include evaluated uncertainty. It may cause some deviation of uncertainty by change component or process of the test for similar products.

## PRODUCT INFORMATION

Effective working space	Up to 120 inches (diagonal/4:3/wide screen)
Communication	USB cable
Dimension(L x W x H)	220 mm x 29 mm x 17 mm
Power	DC 5 V, 100 mA

\*Internal clock frequency is less than 108 MHz

- EMC suppression device is not used during the test.
- Please refer to user's manual.



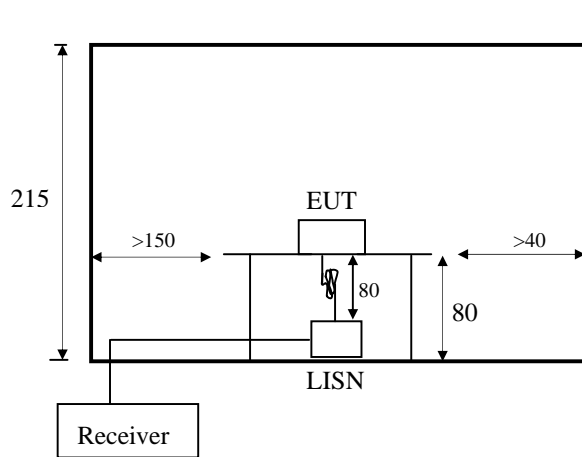
## DESCRIPTIONS OF TEST

### Conducted Emissions:

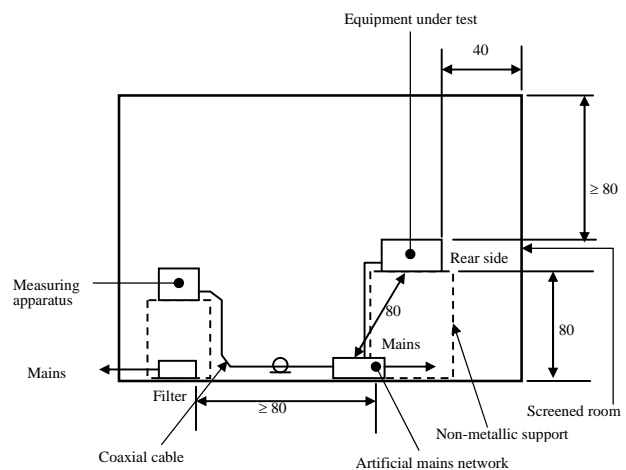
The measurement were performed over the frequency range of 0.15 MHz to 30 MHz using a 50 /50 uH LISN as the input transducer to a Spectrum Analyzer or a Field Intensity Meter. The measurements were made with the detector set for "Peak" amplitude within a bandwidth of 10KHz or for "quasi-peak" & "Average" within a bandwidth of 9 KHz.

#### -Procedure of Test

The line-conducted facility is located inside a shielded room No.1. A 1 m X 1.5 m wooden table 80 cm height is placed 40 cm away from the vertical wall and 1.5 m away from the other wall of the shielded room. The R/S ESCI and Hyup-Rip KNW-407 LISN are bonded to bottom of the shielded room. The EUT is located on the wooden table with distance more than 80 cm from the LISN and powered from the EMCO LISN .The peripheral equipment is powered from the other LISN. Power to the LISNs are filtered by a noise cut power line filters. All electrical cables are shielded by braided tinned steel tubing with inner  $\phi$  1.2 cm. If the EUT is a DC-powered device, power will be derived from the source power supply it normally will be powered from and this supply lines will be connected to the EMCO LISN. All interconnecting cables more than 1m were shortened by non-inductive bundling to a 1m length. Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating conditions. The RF output of the LISN was connected to the R/S receiver to determine the frequency producing the maximum emission from the EUT. The frequency producing the maximum level was reexamined using Quasi-Peak mode by manual measurement, after scanned by automatic Peak mode for frequency range from 0.15 to 30 MHz. The bandwidth of the receiver was set to 10 kHz. The EUT, peripheral equipment, and interconnecting cables were arranged and manipulated to maximize each EME emission.



< Side View >



< Concept Drawing >

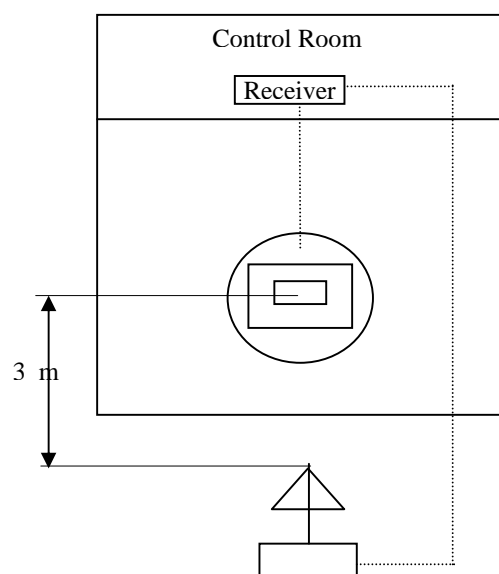
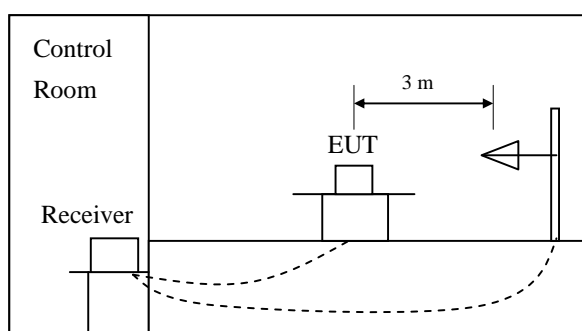
## DESCRIPTION OF TEST

### Radiated Emissions:

The measurement was performed over the frequency range of 30 MHz to 1 GHz using antenna as the input transducer to a Spectrum analyzer or a Field Intensity Meter. The measurement was made with the detector set for "quasi-peak" within a bandwidth of 120 KHz.

#### -Procedure of Test

Preliminary measurements were made at 3 meter using broadband antennas, and spectrum analyzer to determine the frequency producing the max. emission in anechoic chamber. Appropriate precaution was taken to ensure that all emission from the EUT were maximized and investigated. The system configuration, mode of operation, turn-table azimuth and height with respect to the antenna were noted for each frequency found. The spectrum was scanned from 30 MHz to 1000 MHz using broadband antenna. Above 1 GHz, linearly polarized double ridge horn antennas were used. Final measurements were made at open site with 3-meters test distance using S/B bi-log antenna or horn antenna. The OATS have been verified in regular for its normalized site attenuation. The test equipment was placed on a wooden table. Sufficient time for the EUT, peripheral equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. Each frequency found during pre-scan measurements was re-examined by manual. The detector function was set to CISPR quasi-peak mode and the bandwidth of the receiver was set to 120 kHz or 1 MHz depending on the frequency of type of signal. The EUT, peripheral equipment and interconnecting cables were re-configured to the set-up producing the max. emission for the frequency and were placed on top of a 0.8-meter high nonmetallic 1 x 1.5 meter table. The EUT, peripheral equipment, and interconnecting cables were re-arranged and manipulated to maximize each emission. The turntable containing the system was rotated; the antenna height was varied 1 to 4 meters and stopped at the azimuth or height producing the maximum emission. Each emission was maximized by: varying the mode of operation to the EUT and/or peripheral equipment and changing the polarity of the antenna, whichever determined the worst-case emission.





## Equipment Under Test

### EUT Type :

- ☒ Table-Top. ☐ Floor-Standing.  
☐ Table-Top and Floor-Standing(Combination).

### Operation - mode of the E.U.T. :

The equipment under test was operated during the measurement under following conditions :

- ☐ Standby Mode  
☒ Operational Condition : Normal operating mode

### Configuration of the equipment under test :

Following peripheral devices and interface cables were connected during the measurement :

Equipment	Type	Brand	Serial No.
Active-Link	-	PENANDFREE CO.,LTD	UWAA11F0251
Digital Pen	-	PENANDFREE CO.,LTD	N/A
LCD Monitor	P2210f	Dell Inc.	N/A
Notebook Computer	NT-R20	SAMSUNG Electronics	821V93FP401120A
AC Adapter	0335C1960	Li Shin Electronic Co., Ltd.	

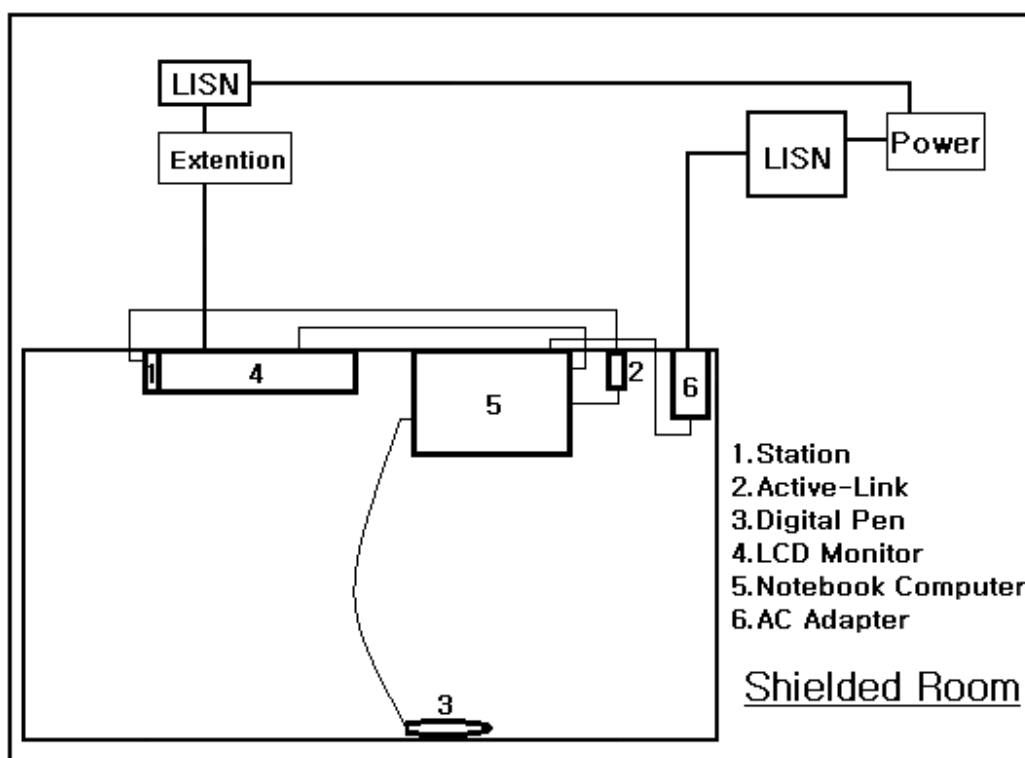
### Connecting Interface Cables :

- Station USB cable cable(without ferrite core) : 4.2 m  
- Pen Rechargeable cable(without ferrite core) : 0.9 m

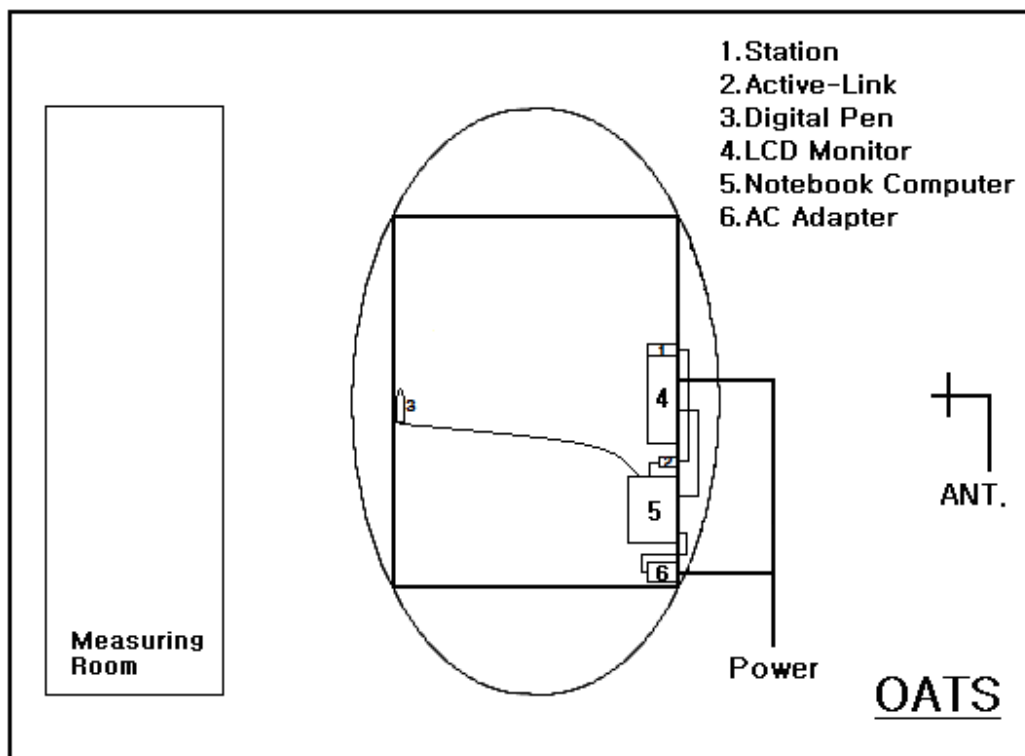
Note :



## Test Set-Up



Conducted Emissions



Radiated Emissions





## SUMMARY

### Emissions

#### Conducted Emission

The requirements are	MET	Not MET
Minimum limit margin	19.4 dB at 0.194 MHz	
Maximum limit exceeding		

**Remarks : Limits are kept with more 3 dB margin.**

Find the test data in following page 10 to 11.

#### Radiated Emission

The requirements are	MET	Not MET
Minimum limit margin	10.44 dB at 480.08 MHz	
Maximum limit exceeding		

**Remarks : Limits are kept with more 3 dB margin.**

Find the test data in following page 13 to 14.

Note : means the test is applicable,  
is not applicable.





## TEST CONDITIONS AND DATA

### Conducted Emissions

[Applicable]

Test Equipment Used

**The test equipment used is calibrated in regular for every year.**

Model Name	Manufacturer	Descriptions	Due Calibration	Serial Number
ESCI	Test Receiver	Rohde & Schwarz	Jul. 19, 2012	100373
KNW-407	LISN	Hyup-Rip	Oct. 10, 2012	8-833-10
ESH3-Z2	Pulse Limiter	Rohde & Schwarz	May 19, 2012	357.8810.52

Environmental Conditions

Temperature	(18.4 ± 1.0)
Humidity	(38.7 ± 1.0) % R.H.
Atmospheric pressure	1005 hPa

Test Program      See the operation mode on page 6.

Test Date          April 06, 2012

Test Area          Conducted room No.1

Note :



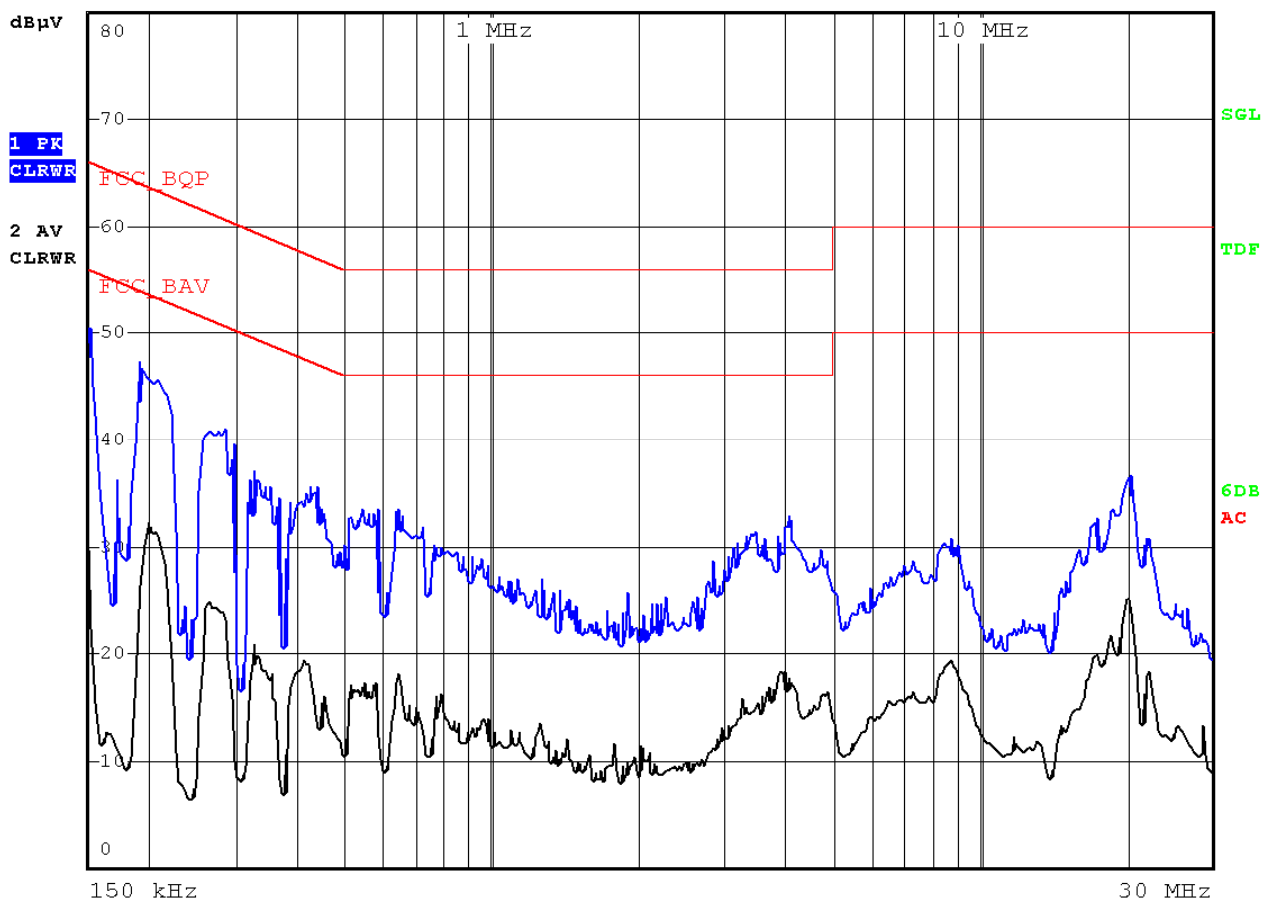
## Conducted Emissions

Live Phase



RBW 9 kHz  
MT 160 ms  
PREAMP OFF

Att 10 dB



Model Name : WB-859-01 120 Vac 60 Hz, Phase : Live

Freq. [MHz]	Measurement [dB $\mu$ V]		Limit [dB $\mu$ V]		Insertion Loss	Cable Loss	Result [dB $\mu$ V]		Margin [dB]	
	Q-peak	Average	Q-peak	Average			Q-peak	Average	Q-peak	Average
0.150	45.39	23.55	66.00	56.00	0.56	0.01	45.96	24.12	20.04	31.88
0.194	44.16	31.57	63.86	53.86	0.51	0.01	44.68	32.09	19.18	21.77
0.270	37.88	24.34	61.12	51.12	0.48	0.02	38.37	24.83	22.75	26.29
0.330	32.72	19.84	59.45	49.45	0.47	0.02	33.21	20.33	26.24	29.12

Note :



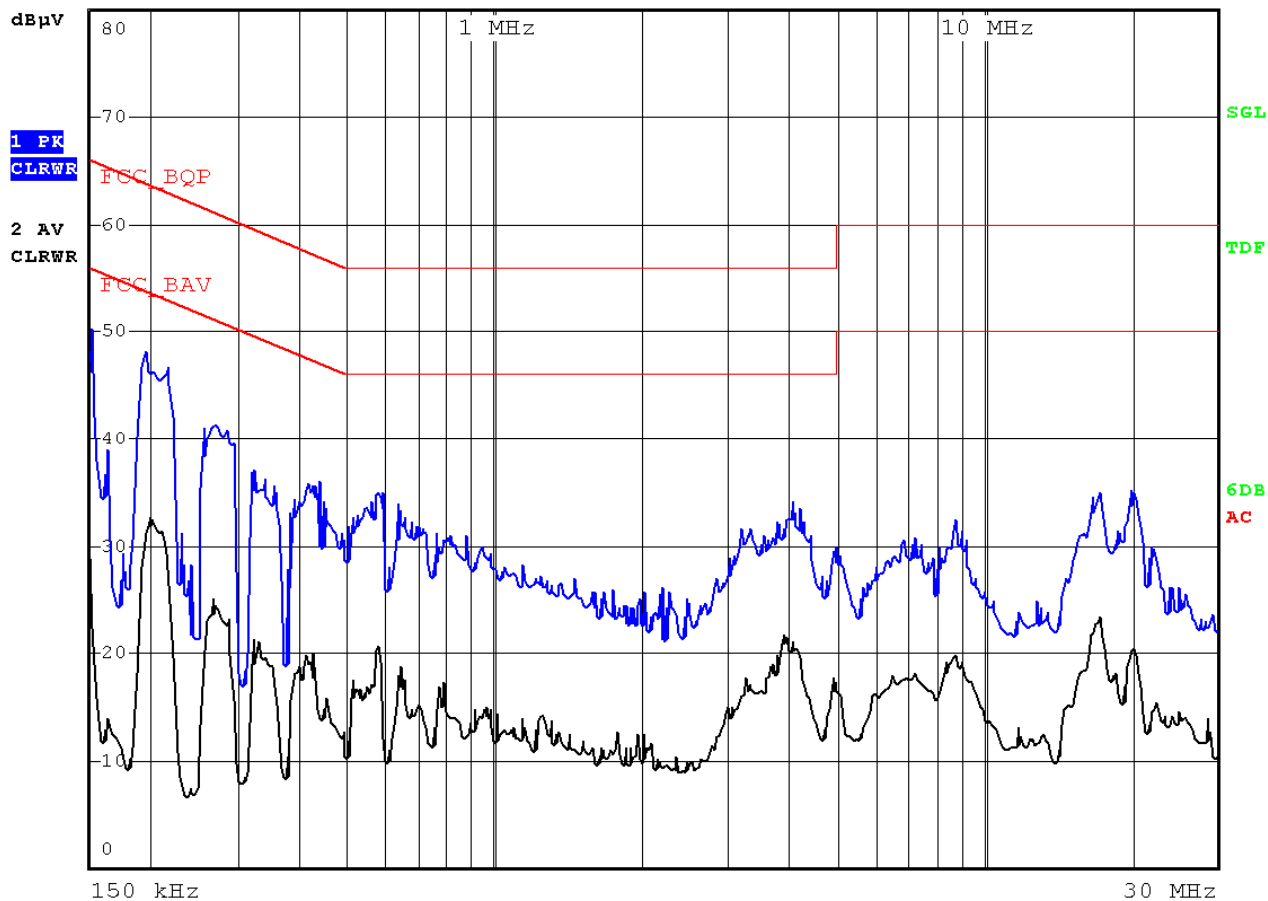
## Conducted Emissions

Neutral Phase



RBW 9 kHz  
MT 160 ms  
PREAMP OFF

Att 10 dB



Model Name : WB-859-01 120 Vac 60 Hz, Phase : Neutral

Freq. [MHz]	Measurement [dB $\mu$ V]		Limit [dB $\mu$ V]		Insertion Loss	Cable Loss	Result [dB $\mu$ V]		Margin [dB]	
	Q-peak	Average	Q-peak	Average			Q-peak	Average	Q-peak	Average
0.150	45.07	23.45	66.00	56.00	0.46	0.01	45.54	23.92	20.46	32.08
0.194	44.43	31.47	63.86	53.86	0.38	0.01	44.82	31.86	19.04	22.00
0.262	38.12	24.62	61.37	51.37	0.31	0.02	38.45	24.95	22.92	26.42
0.322	33.91	20.89	59.66	49.66	0.28	0.02	34.21	21.19	25.44	28.46

Note :



## TEST CONDITIONS AND DATA

### Radiated Emissions

#### [Applicable]

Test Equipment Used

**The test equipment used is calibrated in regular for every year.**

<u>Model Name</u>	<u>Manufacturer</u>	<u>Descriptions</u>	<u>Due Calibration</u>	<u>Serial Number</u>
ESCS 30	Rohde & Schwarz	Test Receiver	May 19, 2012	100171
VULB9160	Schwarzbeck	Bi-Log Antenna	Jul. 19, 2013	3071

#### Environmental Conditions

Temperature	(10.4 ± 3.0)
Humidity	(39.6 ± 3.0) % R.H.
Atmospheric pressure	1002 hPa

Test Program                      See test configuration page 6.

Test Area                          Open Area Test Site #2 (3 m)

Test Date                          April 05, 2012

Note :



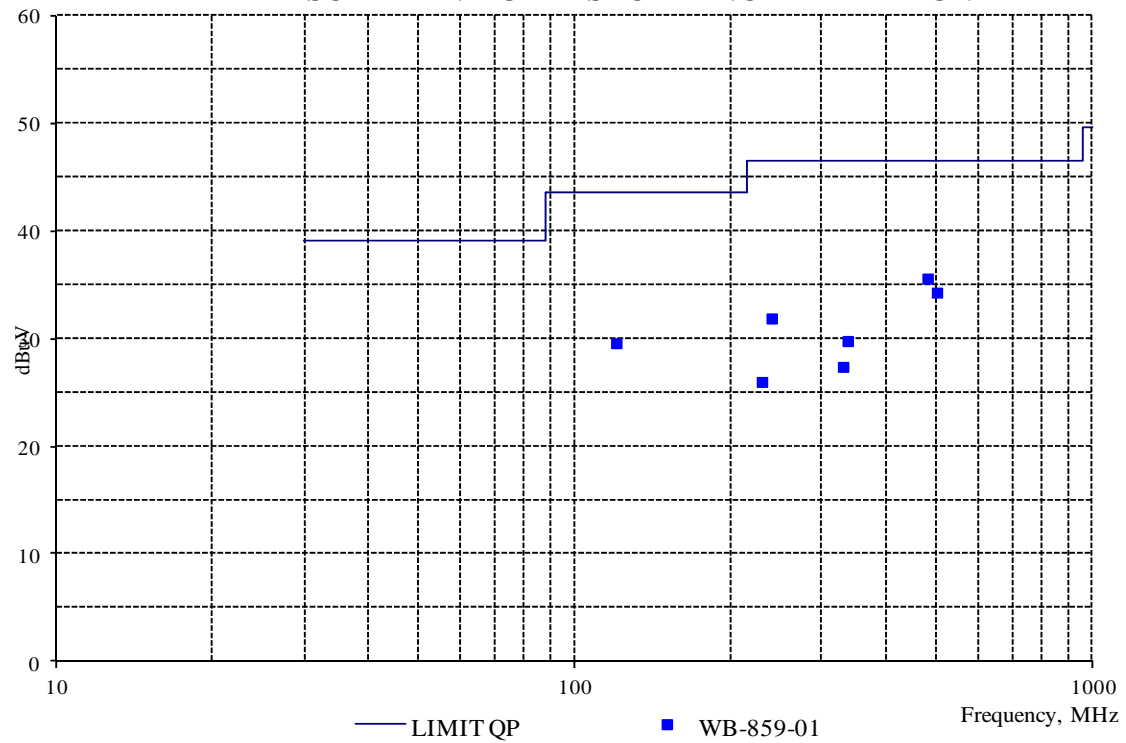
**Radiated Emissions**

Freq. [MHz]	Reading [dB $\mu$ V]	Antenna Factor [dB/m]	Cable Loss [dB]	Polar. [H/V]	Limit [dB $\mu$ V/m]	Result [dB $\mu$ V/m]	Margin [dB]
120.210	16.60	11.18	1.80	H	43.50	29.58	13.92
229.795	13.20	10.28	2.52	V	46.00	26.00	20.00
240.050	18.60	10.69	2.59	H	46.00	31.88	14.12
329.730	11.10	13.60	2.70	V	46.00	27.40	18.60
336.498	13.30	13.75	2.76	V	46.00	29.81	16.19
480.080	14.40	17.44	3.72	H	46.00	35.56	10.44
500.451	12.50	18.00	3.82	V	46.00	34.32	11.68

Note:



### MEASUREMENT OF DISTURBANCE RADIATION





Appendix A. The Photos of Test Setup



Conducted Emissions - Front View



Conducted Emissions - Rear View

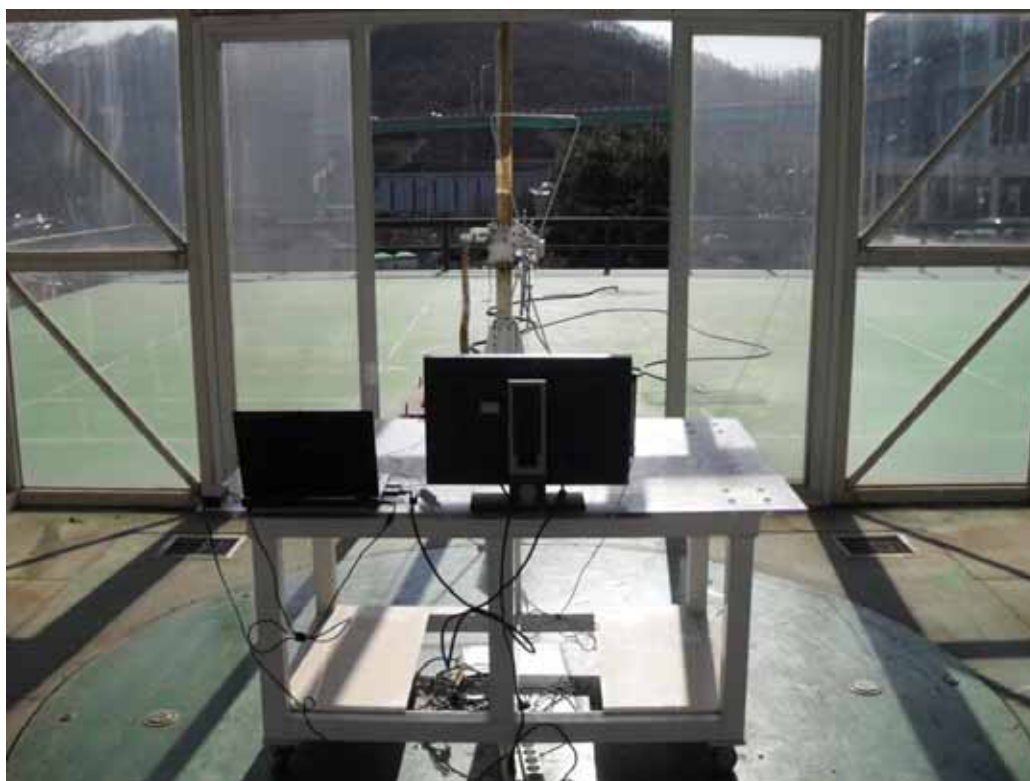




Appendix A. The Photos of Test Setup



**Radiated Emissions** - Front View



**Radiated Emissions** - Rear View



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Appendix B. The Photos of EUT



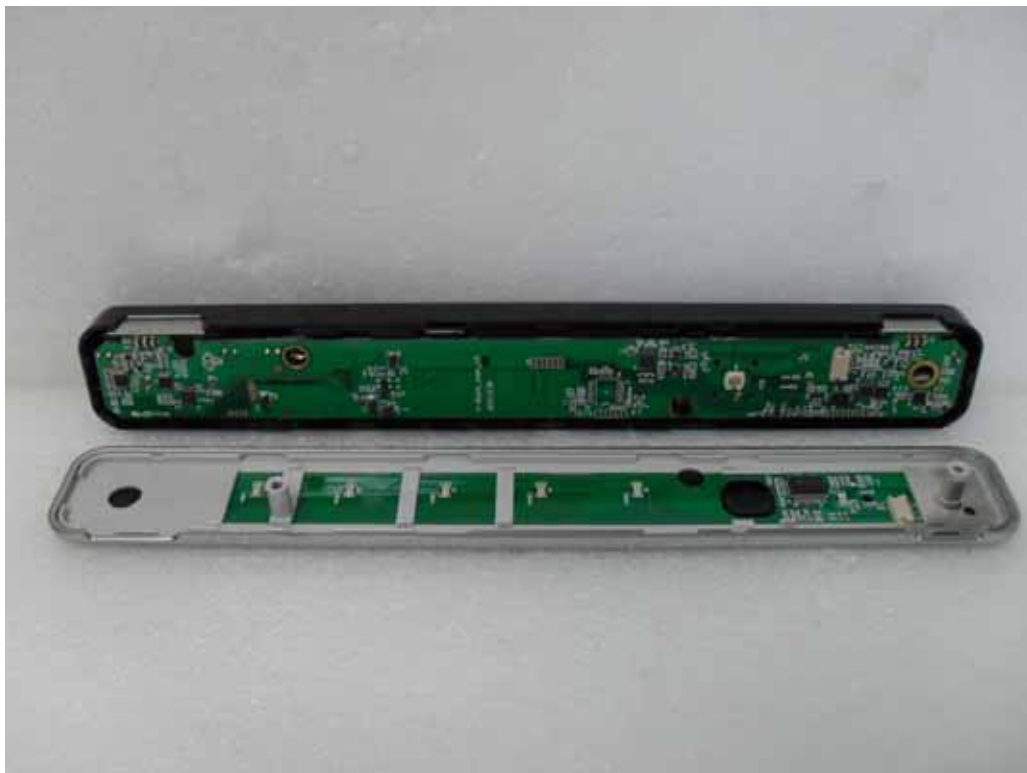
Station (Front View)



Station (Rear View)



Appendix B. The Photos of EUT



Station (Inner View)



Active-Link



Appendix B. The Photos of EUT



Digital Pen